Infectious Diseases and Immunology

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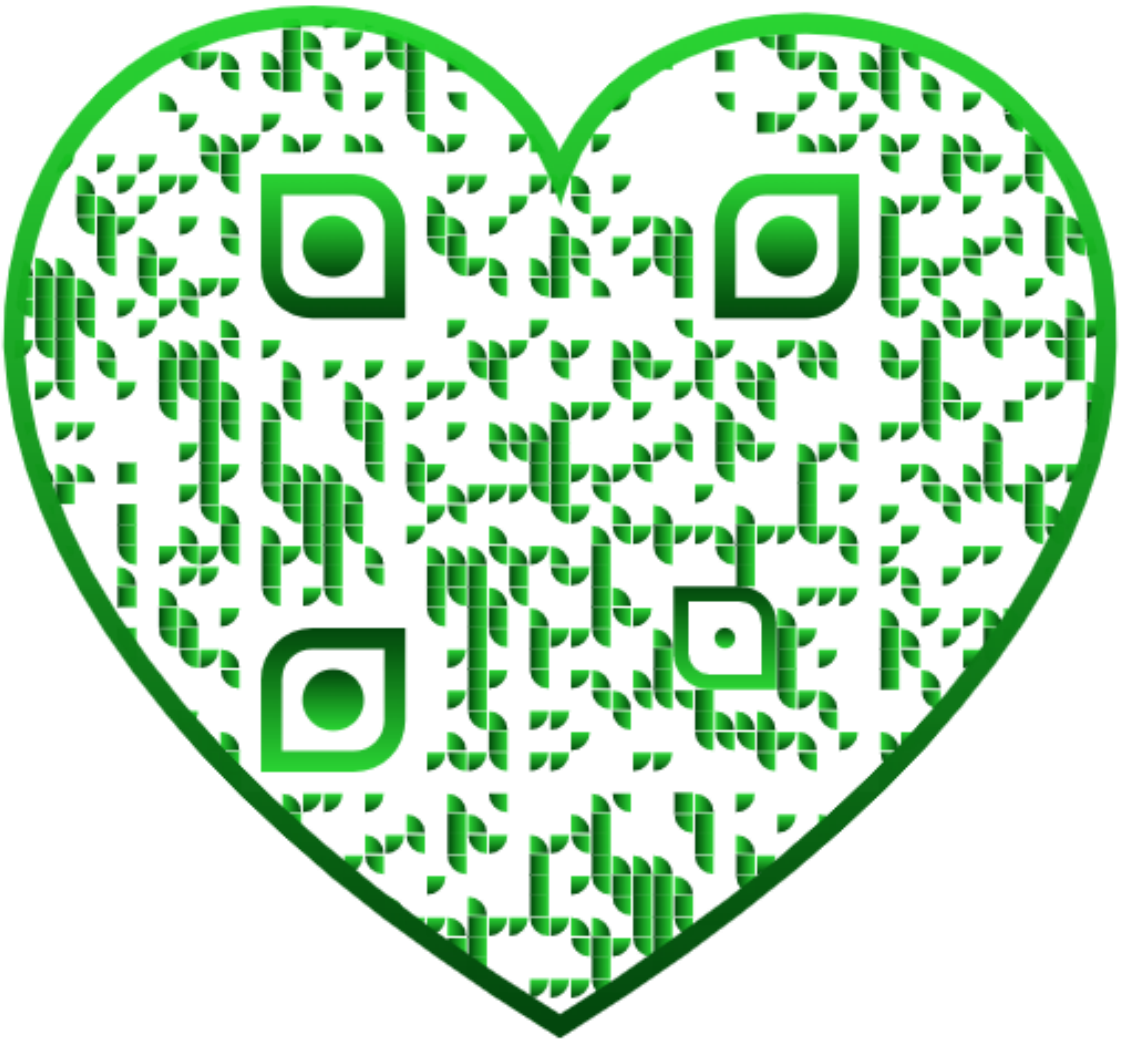
344. A 10-year-old patient (pictured below) calls his parents from summer camp to state that he has had fever, muscular pain (especially in the neck), headache, and malaise. He describes the area from the back of his mandible toward the mastoid space as being full and tender and that his earlobe on the affected side appears to be sticking upward and outward. Drinking sour liquids causes much pain in the affected area. When his father calls your office, you remind him that he had refused immunizations for his child on religious grounds. Which of the following preventable diseases has this child acquired?

a. Mumps
b. Varicella
c. Rubella
d. Measles
e. Diphtheria



345. A 2-month-old child of an HIV-positive mother is followed in your pediatric practice. Which of the following therapies should be considered for this child?

a. Monthly evaluation for Kaposi sarcoma
b. Prophylaxis against *Pneumocystis jiroveci* pneumonia (*Pneumocystis carinii)*
c. Vitamin C supplementation
d. Oral polio virus vaccine
e. Bone marrow transplantation

prophylaxis against P jiroveci (formerly known as P carinii) infection is instituted. While awaiting final determination of this infant's HIV status, which can take several months, prophylaxis with trimethoprim-sulfamethoxazole starting at 6 weeks is usually appropriate

346. A 10-month-old infant on long-term aspirin therapy for Kawasaki disease develops sudden onset of high fever, chills, diarrhea, and irritability. A rapid swab in your office identifies influenza A, adding her to the long list of influenza patients you have seen this December. Over the next few days, she slowly improves and becomes afebrile. However, 5 days after your last encounter you hear from the hospital that she has presented to the emergency center obtunded and posturing with evidence of liver dysfunction. Which of the following statements about her current condition is correct?

a. With proper supportive care, the overall mortality rate is low.
b. With her progressive liver dysfunction, increased total serum bilirubin is anticipated.
c. Administration of *N*-acetylcysteine is first-line therapy.
d. Seizures are uncommon with this condition.
e. Death is usually associated with increased intracranial pressures and herniation.

347. An 18-month-old child presents to the emergency center having had a brief, generalized tonic-clonic seizure. He is now postictal and has a temperature of 40°C (104°F). During the lumbar puncture (which ultimately proves to be normal), he has a large, watery stool that has both blood and mucus in it. Which of the following is the most likely diagnosis in this patient?

a. *Salmonella*
b. Enterovirus
c. Rotavirus
d. *Campylobacter*
e. *Shigella*

Seizure + Diarrhea → Shigella

348. A 2-year-old child is admitted to your hospital team. The child's primary care doctor has been following the child for several days and has noted her to have had high fever, peeling skin, abdominal pain, and a bright red throat. You are concerned because two common pediatric problems that could explain this child's condition have overlapping presenting signs and symptoms. Which of the following statements comparing these two diseases in your differential is true?

a. Neither has cardiac complications.
b. Serologic tests are helpful in diagnosing both.
c. Only one of the diseases has mucocutaneous and lymph node involvement.
d. Pharyngeal culture aids in the diagnosis of one of the conditions.
e. A specific antibiotic therapy is recommended for one of the conditions, but only supportive care is recommended for the other.

349. A patient with hair loss is shown below. The lesion does not fluoresce with a Wood lamp and has not responded well to a variety of topical agents. The lesion is boggy, is spreading, and has tiny pinpoint black dots throughout. Which of the following is the most likely diagnosis?

a. Traction alopecia from tight hair braids
b. Infection with *Trichophyton tonsurans*
c. Alopecia areata
d. Biotinidase deficiency
e. Hypothyroidism

350. An 8-year-old sickle-cell patient arrives at the emergency room (ER) in respiratory distress. Over the previous several days, the child has become progressively tired and pale. The child's hemoglobin concentration in the ER is 3.1 mg/dL. Which of the following viruses commonly causes such a clinical picture?

a. Roseola
b. Parvovirus B19
c. Coxsackie A16
d. Echovirus 11
e. Cytomegalovirus

351. A 10-year-old boy was healthy until about 10 days ago when he developed 7 days of fever, chills, severe muscle pain, pharyngitis, headache, scleral injection, photophobia, and cervical adenopathy. After 7 days of symptoms he seemed to get better, but yesterday he developed fever, nausea, emesis, headache and mild nuchal rigidity. Cerebrospinal fluid (CSF) shows 200 white blood cells (WBC) per microliter (all monocytes) and an elevated protein. Correct statements about this infection include which of the following?

a. The condition is obtained from arthropod vectors
b. CNS involvement is uncommon
c. Most cases are mild or subclinical
d. Appropriate treatment includes intravenous (IV) immune globulin (IVIG) and aspirin
e. Hepatic and renal involvement occurs in the majority of cases

Leptospirosis is the most common zoonotic infection worldwide, and is often a mild or subacute illness,

352. A previously healthy 8-year-old boy has a 3-week history of low-grade fever of unknown source, fatigue, weight loss, myalgia, and headaches. On repeated examinations during this time, he is found to have developed a heart murmur, petechiae, and mild splenomegaly. Which of the following is the most likely diagnosis?

a. Rheumatic fever
b. Kawasaki disease
c. Scarlet fever
d. Endocarditis
e. Tuberculosis

353. A 15-month-old boy is brought to the ER because of fever and a rash. Six hours earlier he was fine, except for tugging on his ears; another physician diagnosed otitis media and prescribed amoxicillin. During the interim period, the child has developed an erythematous rash on his face, trunk, and extremities. Some of the lesions, which are of variable size, do not blanch on pressure. The child is now very irritable, and he does not interact well with the examiner. Temperature is 39.5°C (103.1°F). He continues to have injected, immobile tympanic membranes, but you are concerned about his change in mental status. Which of the following is the most appropriate next step in the management of this infant?

a. Begin administration of IV ampicillin
b. Begin diphenhydramine
c. Discontinue administration of ampicillin and begin trimethoprim with sulfamethoxazole
d. Perform bilateral myringotomies
e. Perform a lumbar puncture

Unsuspected bacteremia caused by H influenzae type B (now rare), Neisseria meningitidis, or S pneumoniae (decreasing in frequency secondary to vaccination) should be considered before prescribing treatment for otitis media in a young, febrile, toxic-appearing infant. In this situation, blood culture should be performed before antibiotic therapy is initiated, and examination of the CSF is indicated if meningitis is suspected.

354. The 3-year-old sister of a newborn baby develops a cough diagnosed as pertussis by nasopharyngeal culture. The mother gives a history of having been immunized as a child. Which of the following is a correct statement regarding this clinical situation?

a. The mother has no risk of acquiring the disease because she was immunized.
b. Hyperimmune globulin is effective in protecting the infant.
c. The risk to the infant depends on the immune status of the mother.
d. Erythromycin should be administered to the infant.
e. The 3-year-old sister should be immediately immunized with an additional dose of pertussis vaccine.

355. A 14-year-old boy is seen in the ER because of a 3-week history of fever between 38.3°C and 38.9°C (101°F and 102°F), lethargy, and a 2.7-kg (6-lb) weight loss. Physical examination reveals marked cervical and inguinal adenopathy, enlarged tonsils with exudate, small hemorrhages on the soft palate, a WBC differential that has 50% lymphocytes (10% atypical), and a palpable spleen 2 cm below the left costal margin. Which of the following therapies should be initiated?

a. Initiation of zidovudine
b. IV acyclovir
c. IV infusion of immunoglobulins and high-dose aspirin
d. Intramuscular penicillin
e. Avoidance of contact sports

To prove a diagnosis of infectious mononucleosis caused by Epstein-Barr virus (EBV), a triad of findings should be present. First, physical findings can include diffuse adenopathy, tonsillar enlargement, an enlarged spleen, small hemorrhages on the soft palate, and periorbital swelling.

356. A 2-year-old child is seen in the emergency center with a 10-day complaint of fever and a limp. The child has an elevated erythrocyte sedimentation rate (ESR) and the radiograph shown below. Which of the following statements about this child's condition is correct?

(Courtesy of Susan John, MD.)

a. It is most commonly caused by *Streptococcus pyogenes*.
b. It can arise following development of deep cellulitis.
c. It usually results in tenderness in the region of infection that is diffuse, not localized.
d. It causes diagnostic radiographic changes on plain films within 48 hours of the beginning of symptoms.
e. It requires antibiotic therapy usually for 10 to 14 days.

357. A 16-day-old infant presents with fever, irritability, poor feeding, and a bulging fontanelle. Spinal fluid demonstrates gram-positive cocci. Which of the following is the most likely diagnosis?

a. *Listeria monocytogenes*
b. Group A streptococci
c. Group B streptococci
d. *Streptococcus pneumoniae*
e. *Staphylococcus aureus*

358. A 16-year-old boy presents to the emergency center with a 2-day history of an abscess with spreading cellulitis. While in the emergency center, he develops a high fever, hypotension, and vomiting with diarrhea. On examination you note a diffuse erythematous macular rash, injected conjunctiva and oral mucosa, and a strawberry tongue. He is not as alert as when he first arrived. This rapidly progressive symptom constellation is likely caused by which of the following disease processes?

a. Kawasaki disease
b. TSST-1–secreting *S aureus*
c. Shiga toxin–secreting *Escherichia coli*
d. α-Toxin–secreting *Clostridium perfringens*
e. Neurotoxin-secreting *Clostridium tetani*

Toxic shock syndrome (TSS) is usually caused by S aureus

359. A 14-month-old infant suddenly develops a fever of 40.2°C (104.4°F). Physical examination shows an alert, active infant who drinks milk eagerly. No physical abnormalities are noted. The WBC count is 22,000/μL with 78% polymorphonuclear leukocytes, 18% of which are band forms. Which of the following is the most likely diagnosis?

a. Pneumococcal bacteremia
b. Roseola
c. Streptococcosis
d. Typhoid fever
e. Diphtheria

In an infant who appears otherwise normal, the sudden onset of high fever, together with a marked elevation and shift to the left of the WBC count, suggests pneumococcal bacteremia

360. A 21-year-old woman has just delivered a term infant. She has had only one visit to her obstetrician, and that was at about 6 weeks of pregnancy. She provides her laboratory results from that visit. The delivered infant is microcephalic, has cataracts, a heart murmur, and hepatosplenomegaly. Your further evaluation of the child demonstrates thrombocytopenia, mild hemolytic anemia, and, on the echocardiogram, patent ductus arteriosus and peripheral pulmonary artery stenosis. Which of the following maternal laboratory tests done at 6 weeks gestation is likely to explain the findings in this child?

a. Positive hepatitis B surface antibody
b. Positive rapid plasma reagin (RPR) with negative Microhemagglutination-Treponema pallidum test (MHATP)
c. Negative rubella titer
d. Negative triple screen
e. Positive varicella titer

The mother's negative rubella titer early in the pregnancy indicates she is susceptible to the infection and its sequelae; her titer undoubtedly now is positive.

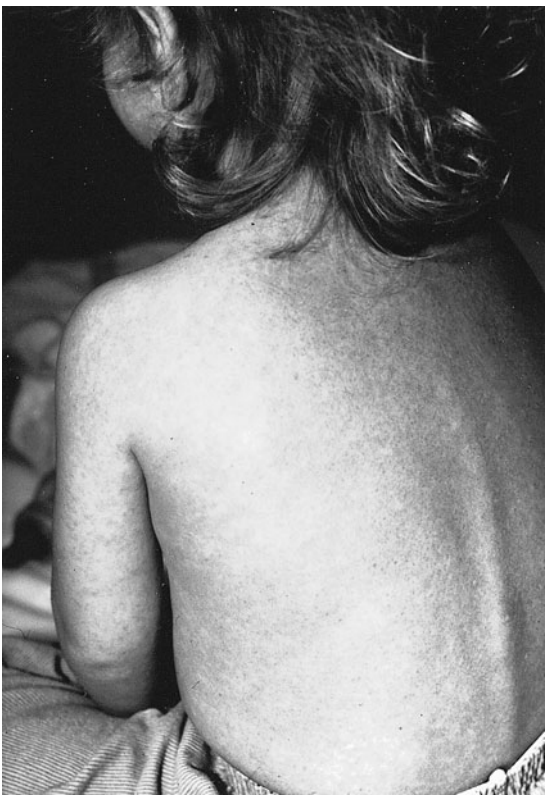
361. The parents of a 7-day-old infant bring her to your office for a swollen eye. Her temperature has been normal, but for the last 2 days she has had progressive erythema and swelling over the medial aspect of the right lower lid near the punctum. Her sclera and conjunctiva are clear. Gentle pressure extrudes a whitish material from the punctum. Which of the following ophthalmic conditions is the correct diagnosis?

a. Chalazion
b. Dacryocystitis
c. Preseptal cellulitis
d. Hyphema
e. Congenital Sjögren syndrome

362. The parents of a 3-year-old patient followed in your clinic recently took their child on quickly planned 5-day trip to Africa to visit an ill grandparent. Everyone did well on the trip, but since their return about 10 days ago the boy has been having intermittent, spiking fevers associated with headache, sweating, and nausea. The parents had not been too concerned since he was relatively well, except for being tired, between the fevers. Today, however, they feel that he looks a bit pale and his eyes appear "yellow." Which of the following is likely to reveal the source of his problem?

a. Hepatitis A IgG and IgM titers
b. Complete blood count (CBC) with smear
c. Hemoglobin electrophoresis
d. Tuberculosis skin test
e. Hepatitis B IgG and IgM titers

363. The child shown below presents with a 3-day history of malaise, fever to 41.1°C (106°F), cough, coryza, and conjunctivitis. He then develops the erythematous, maculopapular rash pictured. He is noted to have white pinpoint lesions on a bright red buccal mucosa in the area opposite his lower molars. Which of the following is the most likely diagnosis?



(Courtesy of Adelaide Hebert, MD.)

a. Parvovirus
b. Rubella
c. Herpes
d. Rubeola ((Measles))
e. Varicella

364. A 14-year-old girl awakens with a mild sore throat, low-grade fever, and a diffuse maculopapular rash. During the next 24 hours, she develops tender swelling of her wrists and redness of her eyes. In addition, her physician notes mild tenderness and marked swelling of her posterior cervical and occipital lymph nodes. Four days after the onset of her illness, the rash has vanished. Which of the following is the most likely diagnosis?

a. Rubella
b. Rubeola
c. Roseola
d. Erythema infectiosum
e. Erythema multiforme

The child in this question likely has mumps. Although mumps is usually thought of as a parotitis (presenting as swelling as described in the question), it is a generalized infection and, as such, can have widespread effects and a variety of clinical presentations. Many infections with the mumps virus are unrecognized because of the substantial rate of subclinical attacks. Meningitis, pancreatitis, and renal involvement can occur as part of the disease

365. A 4-year-old child presents in the clinic with an illness notable for swelling in front of and in back of the ear on the affected side, as well as altered taste sensation. Correct statements about this condition include which of the following?

a. Arthritis is a common presenting complaint in children.
b. The disease could have been prevented by prior immunization with killed whole-cell vaccine.
c. Involvement of the central nervous system (CNS) may occur 10 days after the resolution of the swelling.
d. Orchitis can occur and is almost exclusively seen in prepubertal males.
e. Subendocardial fibroelastosis is a common complication in a child of this age.

366. A bat is found in the bedroom of a 4-year-old patient while the boy is sleeping. The family and the patient deny close contact with or bites from the bat. Which of the following is a correct statement regarding this situation?

a. Therapy is only required if the patient shows signs of rabies infection.
b. Bats are not a natural reservoir for rabies virus; no therapy is required.
c. The patient should be started on the rabies vaccine series.
d. The patient needs immediate treatment with acyclovir.
e. The patient needs immediate treatment with ribavirin.

367. An 8-year-old Cub Scout who returned from an outing 9 days ago is brought to the clinic with the rapid onset of fever, headache, muscle pain, and rash. The maculopapular rash began on the flexor surfaces of the wrist and has become petechial as it spread inward to his trunk. Which of the following is the most likely diagnosis?

a. Lyme disease
b. Tularemia
c. Measles
d. Toxic shock syndrome
e. Rocky Mountain spotted fever

368. The parents of a 7-month-old boy arrive in your office with the child and a stack of medical records for a second opinion. The boy first started having problems after his circumcision in the nursery when he had prolonged bleeding. Studies were sent at the time for hemophilia, but factor VIII and IX activity were normal. At 2 months he developed bloody diarrhea, which his doctor assumed was a milk protein allergy and changed him to soy; his parents note he still has occasional bloody diarrhea. He has seen a dermatologist several times for eczema, and he has been admitted to the hospital twice for pneumococcal bacteremia. During both admissions, the parents were told that the infant's platelet count was low, but they have yet to attend the hematology appointment arranged for them. The child's WBC count and differential were normal. Which of the following is the most likely diagnosis in this child?

a. Idiopathic thrombocytopenic purpura
b. Wiskott-Aldrich syndrome
c. Acute lymphocytic leukemia
d. Adenosine deaminase deficiency
e. Partial thymic hypoplasia

369. A 10-year-old boy from the Connecticut coast is seen because of discomfort in his right knee. He had a large, annular, erythematous lesion on his back that disappeared 4 weeks prior to the present visit. His mother recalls pulling a small tick off his back. Which of the following is a correct statement about this child's likely illness?

Lyme disease, caused by the spirochete Borrelia burgdorferi and transmitted mostly by ticks of the Ixodes family, is characterized by a unique skin lesion, recurrent attacks of arthritis, and occasional involvement of the heart and CNS. Illness usually appears in late summer or early fall, 2 to 30 days after a bite by an infecting tick. Erythema chronicum migrans begins as a red macule, usually on the trunk at the site of tick attachment,

a. The tick was probably a *Dermacentor andersoni.*
b. The disease is caused by a rickettsial agent that is transmitted by the bite of a tick.
c. In addition to skin and joint involvement, CNS and cardiac abnormalities may be present.
d. Therapy with antibiotics has little effect on the resolution of symptoms.
e. The pathognomonic skin lesion is required for diagnosis.

370. Two weeks ago, a 5-year-old boy developed diarrhea, which has persisted to the present time despite dietary management. His stools have been watery, pale, and frothy. He has been afebrile. Microscopic examination of his stools is likely to show which of the following?

a. *Salmonella sonnei*
b. *Enterobius vermicularis*
c. *Sporothrix schenckii*
d. *Toxoplasma gondii*
e. *Cryptosporidium*

Cryptosporidium has become an important cause of diarrhea in immunocompromised patients, particularly those with AIDS.
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371. The rash and mucous membrane lesions shown in the photograph below develop in an infant 5 days into the course of an upper respiratory infection with otitis media; the child is being treated with amoxicillin. The child's condition is likely which of the following?

a. Urticaria
b. Rubeola
c. Stevens-Johnson syndrome
d. Kawasaki disease
e. Scarlet fever

372. An 8-year-old immigrant from rural Central America presents with complaints of weakness, facial swelling, muscle pain, and fever. A CBC reveals marked eosinophilia. Which of the following parasites is most likely to be responsible?

a. *Cryptosporidium parvum*
b. *Sporothrix schenckii*
c. *Giardia lambila*
d. *Enterobius vermicularis*
e. *Trichinella spiralis*

373. A patient presents to the emergency center with a 6-hour history of fever to 38.9°C (102°F). Her mother reports that the patient appeared to be feeling poorly, that she had been eating less than normal, and that she vomited once. About 2 hours prior to arrival at the ER, the mother states that she noted a few purple spots scattered about the body on the patient, especially on the buttocks and legs. On the 30-minute ride to the ER, the purple areas spread rapidly and became coalesced in areas, and the patient is now obtunded. Which of the following is the most likely diagnosis?

a. Henoch-Schönlein purpura
b. Toxic shock syndrome caused by *S aureus*
c. Measles
d. Rocky Mountain spotted fever
e. Meningococcemia

374. A 2-month-old infant comes to the emergency center with fever for 2 days, emesis, a petechial rash, and increasing lethargy. In the ambulance he had a 3-minute generalized tonic/clonic seizure that was aborted with lorazepam. He does not respond when blood is drawn or when an IV is placed, but he continues to ooze blood from the skin puncture sites. On examination, his anterior fontanelle is open and bulging. His CBC shows a WBC of 30,000 cells/μL with 20% band forms. Which of the infant's problems listed below is a contraindication to lumbar puncture?

a. Uncorrected bleeding diathesis
b. Bulging fontanelle
c. Dehydration
d. History of recent seizure
e. Significantly elevated WBC count consistent with bacteremia

375. The mother of one of your regular patients calls your office. She reports that her daughter has a 3-day history of subjective fever, hoarseness, and a bad barking cough. You arrange for her to be seen in your office that morning. Upon seeing this child, you would expect to find which of the following?

a. A temperature greater than 38.9°C (102°F)
b. Expiratory stridor
c. Infection with parainfluenza virus
d. Hyperinflation on chest x-ray
e. A child between 6 and 8 years of age

Croup

Questions 376 to 379

376-b, 377-a, 378-e, 379-c.

For each set of immunologic abnormalities listed in the table below, select the most likely clinical presentation. Each lettered option may be used once, more than once, or not at all.

a. A 5-year-old boy who, after 3 months of age, developed recurrent otitis media, pneumonia, diarrhea, and sinusitis, often with simultaneous infections at two or more disparate sites
b. A distinctive-appearing 8-month-old boy with an interrupted aortic arch, hypocalcemia, and cleft palate
c. A 1-year-old boy with severe eczema, recurrent middle-ear infections, lymphopenia, and thrombocytopenia
d. A 9-year-old with an eczema-like rash and recurrent severe staphylococcal infections
e. A 4-month-old who has had failure to thrive, chronic diarrhea, a variety of rashes, and recurrent serious bacterial, fungal, and viral infections

	Serum IgG	Serum IgA	Serum IgM	T-Cell Function	Parathyroid Function
376.	Normal	Normal	Normal	Decreased	Decreased
377.	Low	Low	Low	Normal	Normal
378.	Low	Low	Low	Decreased	Normal
379.	Normal	High	Low	Decreased	Normal

Questions 380 to 385

380-i, 381-b, 382-a, 383-d, 384-e, 385-f.

Match the disease with the associated organism. Each lettered option may be used once, more than once, or not at all.

a. *Bartonella henselae*
b. *Pseudomonas*
c. Rubivirus
d. Human herpesvirus 6
e. *Escherichia coli*
f. *Helicobacter pylori*
g. Group B streptococci
h. *Listeria monocytogenes*
i. Epstein-Barr virus
j. *Toxocara cati*
k. *Campylobacter jejuni*

380. An 18-year-old college girl with an extremely sore throat and high fever who develops a rash upon administration of ampicillin

381. Foot puncture wound through a tennis shoe of an adolescent exploring a construction site

382. Warm, red, tender axillary lymph nodes in a 5-year-old girl; she has a few red papules on her hand at the site of a feline scratch

383. The appearance of an evanescent, erythematous, maculopapular rash following the rapid defervescence of several days of high fever in a 9-month-old boy

384. A 3-week-old uncircumcised boy with fever and urinary tract infection

385. Several weeks' history of epigastric and periumbilical pain that worsens with fasting and is relieved by eating, in a 9-year-old with guaiac-positive stools

Questions 386 to 388

386-d, 387-c, 388-a

Match the diagnostic test with the associated disease state. Each lettered option may be used once, more than once, or not at all.

a. A 15-year-old sexually active girl with a single non-tender lesion on her labia and regional nontender lymphadenopathy
b. An otherwise healthy 9-year-old boy with pinpoint black dots in the center of an itchy 3-cm boggy patch of hair loss on his scalp
c. An infant born at home 2 days ago who has profuse purulent drainage from both eyes, lid edema, and chemosis
d. A toddler with bloody diarrhea, anemia, and acute renal failure
e. Recurring fever and anemia in an immigrant from central Africa

386. Culture on sorbitol MacConkey medium

387. Culture on modified Thayer-Martin medium

388. Dark field microscopy

Questions 389 to 392

389-c, 390-a, 391-g, 392-b

Match each clinical state with the most likely form of pneumonia. Each lettered option may be used once, more than once, or not at all.

a. Mycoplasmal pneumonia
b. Pneumococcal pneumonia
c. Chlamydial pneumonia
d. Viral pneumonia
e. Tuberculous pneumonia
f. Fungal pneumonia
g. Staphylococcal pneumonia

389. A 6-week-old infant with tachypnea and history of eye discharge at 2 weeks of age.

390. A 14-year-old girl with low-grade fever, cough of 3 weeks' duration, and interstitial infiltrate.

391. A 2-month-old boy with a 3-day history of upper respiratory infection who suddenly develops high fever, cough, and respiratory distress; within 48 hours, the patient has developed a pneumatocele and a left-sided pneumothorax.

392. An 8-year-old girl with fever, tachypnea, and lobar infiltrate. She has failed outpatient therapy of amoxicillin, has developed empyema, and has had to have chest tubes placed.

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Infectious Diseases and Immunology

Answers

344. The answer is a. *(Hay et al, pp 1134-1135. Kliegman et al, pp 1341-1344. McMillan et al, pp 1279-1281. Rudolph et al, pp 1056-1058.)* In addition to the findings described, mumps typically swells to the opposite side in a day or so after symptoms appear on the first side. Other findings include redness and swelling at the opening of Stensen's duct, edema and swelling in the pharynx, and displacement of the uvula on the affected side. A rash would not be expected. It is important to note that while mumps has largely been eliminated with vaccination, other organisms still may cause parotitis. Measles presents in a child with a several days' history of malaise, fever, cough, coryza, and conjunctivitis followed by the typical, widespread, erythematous, maculopapular rash. Koplik spots, white pinpoint lesions on a bright red buccal mucosa often in the area opposite his lower molars, appear transiently and are pathognomonic. Symptoms of rubella, usually a mild disease, include a diffuse maculopapular rash that lasts for 3 days, marked enlargement of the posterior cervical and occipital lymph nodes, low-grade fever, mild sore throat, and, occasionally, conjunctivitis, arthralgia, or arthritis. Signs and symptoms of varicella include a prodrome of fever, anorexia, headache, and mild abdominal pain, followed 24 to 48 hours later by the typical clear, fluid-filled vesicles (dewdrop on a rose petal). The rash of varicella typically starts on the scalp, face, or trunk. The lesions are pruritic and appear in crops over the next several days, with old lesions crusting over as new lesions develop.

Diphtheria (caused by *Corynebacterium diphtheria)* starts with a mild sore throat and malaise (only 50% have fever), but quickly progresses with an adherent membrane that covers the tonsils and can extend to cover the uvula, palate, posterior oropharynx, hypopharynx, and glottic area. Lymphadenopathy and soft tissue swelling lead to a "bull neck" appearance and potential airway compromise.

345. The answer is b. *(Hay et al, pp 1249-1252. Kliegman et al, pp 1325-1327. McMillan et al, pp 947-948, 1404-1407. Rudolph et al, pp 1045-1053,*

1144-1145.) In certain situations, such as in an infant born to an HIV-positive mother, prophylaxis against *P jiroveci* (formerly known as *P carinii*) infection is instituted. While awaiting final determination of this infant's HIV status, which can take several months, prophylaxis with trimethoprim-sulfamethoxazole starting at 6 weeks is usually appropriate.

Severe anemia can be associated with AIDS and can require blood transfusion, especially if there is evidence of respiratory compromise. Bone marrow transplants in AIDS patients have been unsuccessful thus far because of the persistence of virus in macrophages throughout the body. HIV-positive and AIDS patients should receive primary and booster immunization with diphtheria-pertussis-tetanus (DPT) vaccine, measles-mumps-rubella (MMR) vaccine (unless severely immunocompromised), hepatitis B vaccine, and *Haemophilus influenzae* type B conjugated vaccine (HibCV). Inactivated polio vaccine (IPV) is recommended in place of oral polio vaccine (OPV) for all patients now (not just immunosuppressed patients) because of the theoretical risk of paralytic polio. If children with HIV are exposed to measles, they should receive a protective dose of measles immunoglobulin regardless of their immunization history. Pneumovax at age 2 and influenza vaccine are recommended annually. Eventually, all patients infected with HIV will lose weight and fail to grow. The factors responsible include reduced caloric intake because of poor appetite, intestinal malabsorption, and increased resting energy expenditure associated with chronic infection. Maintaining adequate nutrition in AIDS patients is very difficult, but vitamin C supplementation, by itself, has no special benefits. Kaposi sarcoma is rare in children.

346. The answer is e. *(Hay et al, pp 663-664. Kliegman et al, pp 1697-1998. McMillan et al, pp 2019-2020. Rudolph et al, p 1490.)* Reye syndrome is an acquired mitochondrial hepatopathy that results from the interaction of an influenza (or varicella) infection and aspirin use. While prevalence has decreased over the last few decades, mortality remains the same at more than 40% of cases. Liver enzymes and ammonia are elevated, but total bilirubin is not. Patients initially present toward the end of a viral infection with sleepiness, emesis, and abnormal liver functions. As the disease progresses, the patient may develop seizures, coma, hyperventilation, and decorticate posturing. Ultimately they may develop respiratory arrest, loss of deep tendon reflexes (DTRs), and fixed and dilated pupils. Death is usually from cerebral edema and subsequent herniation. While aspirin is no longer routinely used in children as an antipyretic or pain reliever, the increase in the use of aspirin in adults with heart disease requires specific counseling for parents

of children with influenza and varicella to avoid aspirin use. In addition, both of these infections are preventable with proper immunization. *N*-acetylcysteine is protective of hepatocytes in acetaminophen overdose.

347. The answer is e. *(Hay et al, pp 1185-1186. Kliegman et al, pp 1191-1193. McMillan et al, pp 1116-1120. Rudolph et al, pp 985-987.)* Clinical manifestations of shigellosis range from watery stools for several days to severe infection with high fever, abdominal pain, and generalized seizures. In addition, there is a rare and fatal "toxic encephalopathy" seen with *Shigella* infection known as Ekiri syndrome. In general, about 50% of infected children have emesis, greater than two-thirds have fever, 10% to 35% have seizures, and 40% have blood in their stool. Often, the seizure precedes diarrhea and is the complaint that brings the family to the physician. Fever usually lasts about 72 hours, and the diarrhea resolves within 1 to 2 weeks. Presumptive diagnosis can be made on the clinical history; confirmation is through stool culture. Supportive care, including adequate fluid and electrolyte support, is the mainstay of therapy. Antibiotic treatment is problematic; resistance to trimethoprim-sulfamethoxazole and ampicillin is common, necessitating therapy with third-generation cephalosporins in many cases. As always, knowledge of the susceptibility patterns of the bacteria in your area is the key to using the right antibiotic.

348. The answer is d. *(Hay et al, pp 582-583, 1152-1156. Kliegman et al, pp 1036-1041, 1135-1140. McMillan et al, pp 1015-1020, 1125-1130. Rudolph et al, pp 844-845, 993-999.)* The two conditions in consideration are Kawasaki disease and scarlet fever caused by a group A β-hemolytic streptococci. Kawasaki disease is an acute febrile illness of unknown etiology and shares many of its clinical manifestations with scarlet fever. Scarlatiniform rash, desquamation, erythema of the mucous membranes that produces an injected pharynx and strawberry tongue, and cervical lymphadenopathy are prominent findings in both. The most serious complication of Kawasaki disease and scarlet fever is cardiac involvement. Erythrogenic toxin-producing group A β-hemolytic streptococci is the agent responsible for scarlet fever. Isolation of the organism from the nasopharynx and a rise in antistreptolysin titers will confirm the diagnosis. Serologic tests for a variety of infectious agents, both viral and bacterial, have been negative in Kawasaki disease. Rheumatic heart disease is a serious sequela of streptococcal pharyngitis, which can be prevented by appropriate treatment with penicillin. Coronary artery aneurysm and thrombosis are the most serious complications of Kawasaki disease.

The current approach to treatment of Kawasaki disease, which includes specific therapy with aspirin and IV γ-globulin administered within a week of the onset of fever, appears to lower the prevalence of coronary artery dilatation and aneurysm and to shorten the acute phase of the illness.

349. The answer is b. *(Hay et al, p 410. Kliegman et al, pp 2746-2748. McMillan et al, pp 870-873. Rudolph et al, pp 1226-1230.) Trichophyton tonsurans* is a major cause of tinea capitis. It produces an infection within the hair follicle that is unresponsive to topical treatment alone and requires long-term oral therapy with griseofulvin or another antifungal for eradication. Fluorescence is absent on examination by Wood lamp. Diagnosis is made by microscopic examination of KOH preparation of infected hairs and by culture on appropriate media. A severe form of tinea capitis known as *kerion* is shown in the photograph. Enlarged occipital lymph nodes are a common finding. A diagnosis of tinea capitis, and not seborrhea, should be considered in any child between the ages of 6 months and puberty who presents with scaliness and hair loss, even if mild. Seborrhea rarely occurs in that age group. *Microsporum canis* is an occasional cause of tinea capitis, and it does fluoresce under a Wood lamp.

Traction alopecia typically is seen in children who have their hair tied tightly in bows or braids; the hair loss is linear following the area of traction, and is often associated with regional adenopathy. Alopecia areata can appear similar to fungal infections, but the hairs near the active lesion often can be extracted with gentle traction resulting in an attenuated or catagen bulb at the termination of the hair shaft (exclamation hair); it does not produce a kerion as shown in the photograph. Children with biotinidase deficiency and those with hypothyroidism would be unlikely to have only isolated hair loss as the presenting symptom; rather, symptoms might include a variety of neurologic, dermatologic, and ocular complaints.

350. The answer is b. *(Hay et al, pp 1129-1130. Kliegman et al, pp 1357-1360. McMillan et al, pp 1230-1232. Rudolph et al, pp 1058-1059.)* Fifth disease (erythema infectiosum), long recognized as a benign mild exanthem of school-age children, is now known to be caused by human parvovirus B19. Replication of the virus occurs in the erythroid progenitor cells resulting in a decrease in red cell production for about a week in infected patients. While this transient drop in reticulocytes is not noticeable in normal children, patients with hemolytic conditions (such as sickle-cell anemia) thus develop a transient aplastic crisis. A poorly functioning bone marrow (for a

week or more) in a patient with a reduced red-cell life span (about 30 days) can result in profound anemia. Other problems can result in patients infected with parvovirus B19. In patients with immunodeficiency, the B19 infection can be persistent and lead to life-threatening chronic anemia. Infection in a pregnant woman can result in severe anemia in the infected fetus, with secondary hydrops fetalis and death. Roseola is now thought to be caused most often by the human herpesvirus 6. Coxsackie A16 virus causes hand-foot-and-mouth disease. Echo-11 virus frequently causes viral meningitis, and cytomegalovirus causes a congenital infection.

351. The answer is c. *(Hay et al, pp 1209-1210. Kliegman et al, pp 1271-1272. McMillan et al, pp 1076-1078. Rudolph et al, pp 944-945.)* Leptospirosis is the most common zoonotic infection worldwide, and is often a mild or subacute illness, frequently escaping detection. Usually a history of exposure to dogs, cats, livestock, rats, or other wild animals is obtained. Two distinct courses of infection are described: "anicteric" leptospirosis and "icteric" leptospirosis (also called Weil syndrome). Both courses start with similar symptoms, as described in the case vignette, termed the "septicemic" phase. The majority of cases are anicteric, and after a few days of symptom resolution, patients go on to the "immune" phase in which meningitic symptoms return and can last up to a month. Between 50% to 90% of cases have meningeal involvement. Less than 10% of leptospirosis cases are "icteric," but these patients go on to have more severe symptoms involving liver and kidney dysfunction. Penicillin and tetracycline (in children 10 years and older) are appropriate treatments, and seem to shorten the duration of the illness if started in the first week of symptoms. Some recommend prophylaxis with weekly doxycycline in endemic areas of the world. IVIG and aspirin are appropriate treatments for Kawasaki disease, but not leptospirosis.

352. The answer is d. *(Hay et al, p 588. Kliegman et al, pp 1953-1960. McMillan et al, pp 1648-1661. Rudolph et al, pp 909-913.)* The presentation of infective endocarditis can be quite variable, ranging from prolonged fever with few other symptoms to an acute and severe course with early toxicity. A high index of suspicion is necessary to make the diagnosis quickly. Identification of the causative organism (frequently *Streptococcus* sp. or *Staphylococcus* sp.) through multiple blood cultures is imperative for appropriate treatment. Echocardiography may identify valvular vegetations and can be predictive of impending embolic events, but a negative echocardiogram does not rule out endocarditis. Treatment usually consists of 4 to 6 weeks of appropriate

antimicrobial therapy. Bed rest should be instituted only for heart failure. Antimicrobial prophylaxis prior to and after dental cleaning is indicated. The child is older than typical for Kawasaki disease (80% will present under the age of 5 years), and the history is not consistent with the diagnosis. Scarlet fever is typically self-limited and would not be consistent with the 3-week time course. Tuberculosis can cause prolonged low-grade fever, but cardiac involvement is unusual, consisting of pericarditis; thus a friction rub would be the typical examination finding.

353. The answer is e. *(Hay et al, pp 708-711, 764-765. Kliegman et al, pp 2440-2441, 2513-2521. McMillan et al, pp 924-933, 2679-2680. Rudolph et al, pp 900-904, 2169.)* Unsuspected bacteremia caused by *H influenzae* type B (now rare), *Neisseria meningitidis*, or *S pneumoniae* (decreasing in frequency secondary to vaccination) should be considered before prescribing treatment for otitis media in a young, febrile, toxic-appearing infant. In this situation, blood culture should be performed before antibiotic therapy is initiated, and examination of the CSF is indicated if meningitis is suspected.

The classic signs of meningitis are found with increasing reliability in children older than 6 months. Nevertheless, a febrile, irritable, inconsolable infant with an altered state of alertness deserves a lumbar puncture even in the absence of meningeal signs. A petechial rash, characteristically associated with meningococcal infection, has been known to occur with other bacterial infections as well. Organisms may be identified on smear of these lesions.

A fever accompanied by inability to flex rather than rotate the neck immediately suggests meningitis (a sign more reliable in children older than 12 to 18 months of age). An indolent clinical course does not rule out bacterial meningitis. A lumbar puncture is of prime diagnostic importance in determining the presence of bacterial meningitis, which requires immediate antibiotic therapy. A delay in treatment can lead to complications such as cerebrovascular thrombosis, obstructive hydrocephalus, cerebritis with seizures or acute increased intracranial pressure, coma, or death. A missed diagnosis of meningitis is one of the most common reasons for civil litigation involving a pediatrician. In the described patient, lumbar puncture is warranted because of the change in his clinical status.

354. The answer is d. *(Hay et al, pp 1194-1196. Kliegman et al, pp 1178-1182. McMillan et al, pp 1094-1097. Rudolph et al, pp 973-975.)* Newborn infants exposed to pertussis are at considerable risk of being infected regardless of the immune status of the mother. In contrast to other childhood infectious

diseases, pertussis is not entirely prevented by transplacentally acquired antibody. Hyperimmune globulin is ineffective and not recommended. Natural immunity conferred by infection is lifelong. Because immunity acquired by immunization declines with age, however, many adults who were immunized in infancy are susceptible to pertussis. The Tdap vaccine has been introduced specifically to address this waning immunity; now, instead of merely receiving a scheduled tetanus (and diphtheria) booster with Td, adults may receive the Tdap which includes a pertussis booster. Erythromycin achieves high concentrations in respiratory secretions and is effective in eliminating organisms from the respiratory tract of patients. In exposed, susceptible persons, erythromycin may be effective in preventing or lessening severity of the disease if administered during the preparoxysmal stage. Immunization against pertussis is unnecessary if the patient has had culture-proven pertussis.

355. The answer is e. *(Hay et al, pp 1123-1124. Kliegman et al, pp 1372-1376. McMillan et al, pp 1241-1246. Rudolph et al, pp 1035-1039.)* To prove a diagnosis of infectious mononucleosis caused by Epstein-Barr virus (EBV), a triad of findings should be present. First, physical findings can include diffuse adenopathy, tonsillar enlargement, an enlarged spleen, small hemorrhages on the soft palate, and periorbital swelling. Second, the hematologic changes should reveal a predominance of lymphocytes with at least 10% of these cells being atypical. Third, the characteristic antibody response should be present. Traditionally, heterophil antibodies can be detected when confirming a diagnosis of infectious mononucleosis. These antibodies may not be present, however, particularly in young children. Alternatively, specific antibodies against viral antigens on the EBV can be measured. Antibodies to viral capsid antigen (VCA) and to anti-D early antigen are elevated prior to the appearance of Epstein-Barr nuclear antigen (EBNA) and are therefore markers for acute infection. IgG VCA and EBNA persist for life, whereas anti-D disappears after 6 months. Adolescents with this condition, because of the enlarged spleen, should avoid contact sports until the splenomegaly has resolved.

While some features of the other conditions can overlap with EBV infection, the totality of the presentation in the case strongly suggests EBV as the causative agent. Initiation of zidovudine would be indicated if the child were proven to have HIV disease. IV acyclovir might be indicated for varicella infection. IV infusion of immunoglobulins and high dose aspirin suggest a diagnosis of Kawasaki disease, which is usually not seen at this age. Intramuscular penicillin might be helpful in streptococcal pharyngitis, but atypical lymphocytes are not usually seen with this condition.

356. The answer is b. *(Hay et al, pp 797-799. Kliegman et al, pp 2841-2845. McMillan et al, pp 2497-2499. Rudolph et al, pp 835, 904-907.)* Acute osteomyelitis tends to begin abruptly, with fever and marked, localized bone tenderness that usually occurs at the metaphysis. Redness and swelling frequently follow. Although usually the result of hematogenous bacterial spread, particularly of *S aureus,* acute osteomyelitis can follow an episode of deep cellulitis or septic joint and should be suspected whenever these occur. Diagnosis often must be based on clinical grounds because early soft tissue changes on plain radiograph often take 3 days to develop, and diagnostic bone changes may not be visible on plain films for up to 12 days after onset of the disease; the radiograph shown demonstrates lytic lesions in the proximal tibia. Bone scans with radionuclides, however, can be useful in the diagnosis of osteomyelitis within 24 to 48 hours of symptoms and in its differentiation from cellulitis and septic arthritis. Magnetic resonance imagining (MRI) has become more widely used for the diagnosis of osteomyelitis, as it is very sensitive and specific.

Caution must be exercised, however, when interpreting a normal bone scan in a patient suspected of having osteomyelitis; falsely normal bone scans do occur in patients with active bone infection. Antibiotic treatment must be initiated immediately to avoid further extension of infection into bone, where adequate drug levels are difficult to achieve. Treatment is usually continued for at least 3 weeks.

357. The answer is c. *(Hay et al, pp 764-765, 1089-1090. Kliegman et al, pp 1145-1149, 2513-2521. McMillan et al, pp 924-933. Rudolph et al, pp 900-904, 999-1001.)* Many organisms can cause meningitis in the neonate, including *E coli, L monocytogenes, H influenzae,* gram-negative rods, group B and D streptococci, and coagulase-positive and coagulase-negative staphylococci; statistically, the most likely cause in this case is late-onset group B streptococci (GBS). Early onset GBS is seen in the first 7 days of life and is associated with maternal complications such as prolonged rupture and chorioamnionitis; late onset GBS occurs after 7 days of life and is not related to maternal issues but rather environmental exposures. As expected, the incidence of early onset GBS has been steadily dropping with maternal prophylaxis; the incidence of late onset GBS has remained unchanged during the same time period. Clinical manifestations of meningitis in neonates include lethargy, bulging fontanelle, seizures, and nuchal rigidity. The diagnosis is made with examination and culture of the CSF. Treatment is begun while awaiting the results of the spinal fluid analysis. Appropriate initial

antibiotic coverage must include activity against gram-positive and gram-negative organisms (ampicillin and gentamicin or ampicillin and cefotaxime).

358. The answer is b. *(Hay et al, p 1164. Kliegman et al, pp 1128-1129. McMillan et al, pp 1124-1125. Rudolph et al, p 992.)* Toxic shock syndrome (TSS) is usually caused by *S aureus*, but a similar syndrome (sometimes called toxic shock-like syndrome [TSLS]) may be caused by *Streptococcus* sp. The strains of *S aureus* responsible secrete toxic shock syndrome toxin 1 (TSST-1), and can cause "menstrual" TSS (associated with intravaginal devices like tampons, diaphragms, and contraceptive sponges) or "nonmenstrual" TSS associated with pneumonia, skin infection (as in this patient), bacteremia, or osteomyelitis. The diagnosis is made clinically, and the case description is typical. Treatment includes blood cultures followed by aggressive fluid resuscitation and antibiotics targeting *S aureus*. Kawasaki is not typically seen in adolescents, and is not as rapidly progressive. Shiga toxin–producing strains of *E coli* and *Shigella* are usually associated with hemolytic-uremic syndrome. *Clostridium perfringens* can secrete several toxins; one is an α-toxin that causes hemolysis, platelet lysis, increased vascular permeability, and hepatotoxicity. The neurotoxin secreted by *C tetani* causes tetanus.

359. The answer is a. *(Hay et al, pp 1160-1163. Kliegman et al, pp 1087-1089. McMillan et al, pp 908-911, 1103. Rudolph et al, pp 307-308.)* In an infant who appears otherwise normal, the sudden onset of high fever, together with a marked elevation and shift to the left of the WBC count, suggests pneumococcal bacteremia. The incidence of pneumococcal disease producing this picture may be decreasing with the widespread use of a pneumococcal vaccine. Viral infections such as roseola occasionally can present in a similar fashion but without such profound shifts in the blood leukocyte count. Streptococcosis refers to prolonged, low-grade, insidious nasopharyngitis that sometimes occurs in infants infected with group A β-hemolytic streptococci. Neither typhoid fever nor diphtheria produces markedly high WBC counts; both are characterized by headache, malaise, and other systemic signs. Other bacteria that should be considered in a child with this presentation include *H influenzae* type B (rare in the vaccinated child) and meningococcus.

360. The answer is c. *(Hay et al, pp 1132-1133. Kliegman et al, pp 1337-1341. McMillan et al, pp 1272-1275. Rudolph et al, pp 1075-1079, 2312-2313.)* When German measles (rubella) occurs during the first 2 months of pregnancy, it has a severe effect on the fetus, including cardiac defects, cataracts,

and glaucoma. The most common cardiac defects are patent ductus arteriosus, which can be accompanied by peripheral pulmonary artery stenosis, and atrial and ventricular septal defects. A myriad of other complications vary in incidence with the timing of the infection during pregnancy, including thrombocytopenia, hepatosplenomegaly, hepatitis, hemolytic anemia, microcephaly, and a higher risk of developing insulin-dependent diabetes mellitus. The mother's negative rubella titer early in the pregnancy indicates she is susceptible to the infection and its sequelae; her titer undoubtedly now is positive.

A positive hepatitis B surface antibody indicates successful vaccination or old, resolved infection. The positive RPR (a screening test for syphilis) with negative MHATP (the confirmatory test for syphilis) points away from this TORCH infection, but can be associated with a variety of conditions, such as systemic lupus erythematosus or other collagen vascular diseases. The triple screen, usually done at 16 to 18 weeks' gestation, identifies infants at risk for conditions such as Down syndrome or neural tube defects. The positive varicella titer indicates either previous natural infection or successful vaccination.

361. The answer is b. *(Hay et al, pp 430-432. Kliegman et al, p 2587. McMillan et al, pp 809-810. Rudolph et al, p 2367.)* Dacryocystitis is an infection of the nasolacrimal sac. In newborns it is associated with congenital nasolacrimal duct obstruction, which is seen in 6% of normal infants. Nasolacrimal duct obstruction is thought to be caused by the failure of epithelial cells forming the duct to canalize. Treatment of this benign, usually self-limited condition involves nasolacrimal massage and cleaning the area with warm washcloths; failure to open the duct by 6 months usually results in a referral to ophthalmology for surgical opening. When the lacrimal sac is infected, as in dacryocystitis, the patient requires a course of antibiotics to clear the infection.

Chalazion is a firm, nontender nodule that results from a chronic granulomatous inflammation of the meibomian gland. Preseptal (periorbital) and orbital cellulitis may be distinguished by clinical examination. Blood in the anterior chamber of the eye is called a hyphema. Congenital Sjögren syndrome doesn't exist as an entity; however, mothers with Sjögren syndrome may have infants with congenital lupus.

362. The answer is b. *(Hay et al, pp 1214-1222. Kliegman et al, pp 1477-1484. McMillan et al, pp 1341-1350. Rudolph et al, pp 1136-1142.)* The child in the question likely has malaria; a Giemsa-stained smear of peripheral blood will

assist in the identification of the malaria species. Blood smears over several days may be required to identify the organism; a single negative "malaria prep" does not eliminate the diagnosis from the differential. Depending on the species of malaria causing the infection, a patient classically presents with paroxysms of fever with intervening periods of relative wellness (except for fatigue). Other symptoms commonly reported include sweating, rigors, headache; abdominal, back, and muscle pain; nausea and vomiting; and, as in this case, pallor and jaundice. Children can present with anorexia, hepatosplenomegaly, thrombocytopenia, and low WBC count.

The family in the question had a hastily arranged trip and did not get prophylaxis prior to departure. Therapy for this condition is complicated by a variety of resistance problems, depending on the location of the travel. Visiting the Centers for Disease Control and Prevention's Web site (www.cdc.gov) provides up-to-date data on recommended prophylaxis prior to travel, as well as therapy for the infected patient.

Of the other answers, hepatitis A is a possibility, but the pattern of high, spiking fevers after visiting an endemic area and without prophylaxis makes malaria a more likely choice. Sickle-cell anemia is a possibility, but this child had no previous history of this condition. Tuberculosis is unlikely to present so quickly after a trip, and the skin test would not be expected to become positive for 2 to 12 weeks after exposure. Hepatitis B is unlikely in this time course.

363. The answer is d. *(Hay et al, pp 1130-1131. Kliegman et al, pp 1331-1337. McMillan et al, pp 1275-1279. Rudolph et al, pp 1053-1056.)* The picture and clinical history presented are most common for the diagnosis of measles (rubeola). This is an uncommon disease in areas where immunization rates are high, but sporadic outbreaks do occur. The rash typically lasts 6 days. Complications are common, including pneumonia, laryngitis, myocarditis, and encephalitis.

Parvovirus B19 causes erythema infectiosum (fifth disease), which presents with low-grade fever, headache, and mild upper respiratory infection (URI) symptoms; the rash is "slapped cheek" in appearance. Rubella in this age of child would present with mild URI symptoms, retroauricular, posterior cervical and postoccipital lymphadenopathy, and then a diffuse erythematous macular-papular rash that clears in about 72 hours. Herpes, depending on where it presents, usually is found to have thin-walled vesicles on an erythematous bases. Varicella presents with fever, malaise, headache, moderate fever 37.8°C to 38.9°C (100°F to 102°F), and then crops of intensely pruritic red macules that evolve into fluid-filled vesicles.

364. The answer is a. *(Hay et al, pp 1132-1133. Kliegman et al, pp 1337-1341. McMillan et al, pp 1272-1275. Rudolph et al, pp 1075-1079.)* Symptoms of rubella (German measles), usually a mild disease, include a diffuse maculopapular rash that lasts for 3 days, marked enlargement of the posterior cervical and occipital lymph nodes, low-grade fever, mild sore throat, and, occasionally, conjunctivitis, arthralgia, or arthritis; it has become a rare disease in the United States. Persons with rubeola (measles) develop a severe cough, coryza, photophobia, conjunctivitis, and a high fever that reaches its peak at the height of the generalized macular rash, which typically lasts for 5 days. Koplik spots on the buccal mucosa are diagnostic; it, too, is a rare disease in the United States. Roseola is a viral exanthem of infants in which the high fever abruptly abates as a rash appears. Erythema infectiosum (fifth disease) begins with bright erythema on the cheeks ("slapped cheek" sign), followed by a red maculopapular rash on the trunk and extremities, which fades centrally at first. Erythema multiforme is a poorly understood syndrome consisting of skin lesions and involvement of mucous membranes. A number of infectious agents and drugs have been associated with this syndrome.

365. The answer is c. *(Kliegman et al, pp 1035-1036. McMillan et al, pp 1141-1142. Rudolph et al, pp 1056-1058.)* The child in this question likely has mumps. Although mumps is usually thought of as a parotitis (presenting as swelling as described in the question), it is a generalized infection and, as such, can have widespread effects and a variety of clinical presentations. Many infections with the mumps virus are unrecognized because of the substantial rate of subclinical attacks. Meningitis, pancreatitis, and renal involvement can occur as part of the disease. Many patients with mumps have some WBCs in their spinal fluid. The meningitis that occurs with mumps can occur at the same time as the parotitis, or following the parotitis by about 10 days. Orchitis, seen most frequently in postpubertal males, has been reported in young children as well. All of these problems can be prevented by prior immunization with live attenuated virus vaccine; widespread use of this vaccine has reduced the number of cases in the United States to less than 500 per year. Arthritis is rare in children. Subendocardial fibroelastosis in a newborn was once thought to be associated with prenatal infection with mumps, but this does not appear to be true.

366. The answer is c. *(Hay et al, pp 277-278, 1135-1136. Kliegman et al, pp 1423-1426. McMillan et al, p 710. Rudolph et al, pp 1062-1064.)* Rabies infection is rare in the United States, but about 50,000 cases occur annually

worldwide. While dogs are the most frequent vector of the infection in most parts of the world, immunization of pets in the United States has minimized this reservoir. The most common animal to be infected with rabies in the United States is the raccoon; other potential vectors include skunks, bats, foxes, and coyotes. Small rodents such as mice, squirrels, and rabbits rarely carry the disease. Bats have been associated with the majority of the rabies cases in the United States, with most victims not having an obvious bite. Therefore, the CDC recommends that postexposure prophylaxis (PEP) be considered for any close encounter with a bat, even without an obvious bite, such as the one described above. PEP consists of wound cleansing (if there is a wound), rabies immune globulin (RIG) and the five injection rabies vaccine series. Modifications may be made for patients who have received PEP in the past. Rabies is almost uniformly fatal; many different medications have been attempted, including ribavirin and α-interferon, without success. Of the six reported cases of survival from rabies infection, five had some of the recommended PEP.

367. The answer is e. *(Hay et al, p 1138. Kliegman et al, pp 1289-1293. McMillan et al, pp 987-991. Rudolph et al, pp 1013-1015.)* The incubation period for Rocky Mountain spotted fever (RMSF) has a range of 1 to 14 days. A brief prodromal period consisting of headache and malaise is typically followed by the abrupt onset of fever and chills. A maculopapular rash starts on the second to fourth day of illness on the flexor surfaces of the wrists and ankles before moving in a central direction. Typically, the palms and soles are involved. The rash can become hemorrhagic within 1 or 2 days. Hyponatremia and thrombocytopenia may be seen. Doxycycline is the appropriate treatment, and it must be started early in the course to be effective.

Tularemia has a variable presentation including abrupt onset of fever, chills, malaise, weakness, and headache, and also a variety of skin rashes. Children often have fever, pharyngitis, hepatosplenomegaly, and nonspecific constitutional symptoms.

In the differential diagnosis of RMSF are a number of other diseases. A morbilliform eruption can precede a petechial rash caused by *N meningitidis.* Viral infections, particularly by the enteroviruses, can cause a severe illness that resembles RMSF. Atypical measles is seen primarily in persons who received the killed measles vaccine before 1968. After exposure to wild-type measles, such a person can develop a prodrome consisting of fever, cough, headache, and myalgia. This is usually followed by the development of pneumonia and an urticarial rash beginning on the extremities. TSS is a

disease characterized by sudden onset of fever, diarrhea, shock, inflammation of mucous membranes, and a diffuse macular rash resulting in desquamation of the hands and feet.

Lyme disease is seen with an early period of localized disease including erythema migrans, possibly with flu-like symptoms, followed by a distinctive period of erythema migrans, arthralgia, arthritis, meningitis, neuritis, and carditis.

368. The answer is b. *(Hay et al, pp 927-928. Kliegman et al, pp 890-891. McMillan et al, pp 2467-2468. Rudolph et al, p 799.)* The patient described has Wiskott-Aldrich syndrome, an X-linked recessive combined immunodeficiency characterized by thrombocytopenia, eczema, and increased susceptibility to infection. Problems occur early, and frequently prolonged bleeding from the circumcision site is the first clue. The thrombocytopenia also manifests as bloody diarrhea and easy bruising. Patients have impaired humoral immunity with a low serum IgM and a normal or slightly low IgG; they also have cellular immunity problems, with decreased T cells and depressed lymphocyte response. Few live past their teens, frequently succumbing to malignancy caused by EBV infection.

Idiopathic thrombocytopenic purpura (ITP) is an isolated and usually transient thrombocytopenia thought to be secondary to a viral infection. These children do not have increased susceptibility to infection. Acute lymphocytic leukemia (ALL) usually presents with abnormalities in all three cell lines, and does not have a prolonged course as in the described patient. Adenosine deaminase (ADA) deficiency is a type of severe combined immunodeficiency (SCID) but patients always have lymphopenia from birth; platelets are not affected. Partial thymic hypoplasia (partial DiGeorge) patients usually do not have problems early on and can grow up normally, and they do not have thrombocytopenia.

369. The answer is c. *(Hay et al, pp 1211-1213. Kliegman et al, pp 1274-1278. McMillan et al, pp 1046-1049. Rudolph et al, pp 946-948.)* Lyme disease, caused by the spirochete *Borrelia burgdorferi* and transmitted mostly by ticks of the Ioxodes family, is characterized by a unique skin lesion, recurrent attacks of arthritis, and occasional involvement of the heart and CNS. Illness usually appears in late summer or early fall, 2 to 30 days after a bite by an infecting tick. Erythema chronicum migrans begins as a red macule, usually on the trunk at the site of tick attachment, which enlarges in a circular fashion with central clearing. Nonspecific systemic signs include headache, fever, and

malaise. Joint involvement generally occurs days to years after onset of the rash. Cardiac disease consists primarily of disturbances of rhythm. Involvement of the CNS is evidenced by headache and stiff neck. The diagnosis should be suspected when any of the signs and symptoms occur, because the disease can present in an atypical manner. The characteristic lesion of erythema chronicum migrans, as well as the history of tick bite, have frequently not been noted by the patient. It is not until late joint, heart, or neurologic manifestations occur, and Lyme disease is suspected, that serologic evidence confirms the etiology. Serologic evidence is sought when the patient has spent time in summer months in endemic areas or there is a risk of tick bite. Treatment with penicillin or tetracycline results in a faster resolution of symptoms and prevention of later complications, especially if given early in the course of the disease. The *Dermacentor* family of ticks is typically associated with RMSF, while the *Ixodes* family is associated with Lyme disease. *Borrelia* is a spirochete, not a *Rickettsia*.

370. The answer is e. *(Hay et al, p 1229. Kliegman et al, p 1465. McMillan et al, pp 1327-1329. Rudolph et al, pp 1126-1128.) Cryptosporidium* has become an important cause of diarrhea in immunocompromised patients, particularly those with AIDS. It can also affect patients who are immunocompetent, and has been recognized as an agent responsible for epidemics of diarrhea in day-care centers. Although the disease is self-limited in immunocompetent individuals, treatment with the antiparasitic nitazoxanide can improve symptoms quickly. Persistent, nonsuppurative diarrhea as described in the question can be caused by such organisms as amebas, whipworms (trichuriasis), *Cryptosporidium,* or *Giardia lamblia. Salmonella sonnei* can be grown in culture, but microscopy is not helpful other than finding fecal leukocytes. *Enterobius vermicularis* is pinworms, which causes rectal itching and not diarrhea. Sporotrichosis is a fungal infection of the cutaneous and subcutaneous tissue that typically does not cause diarrhea. Acquired *Toxoplasma gondii* can infest any body tissue. Infection can result in fever, myalgia, lymphadenopathy, maculopapular rash, hepatomegaly, pneumonia, encephalitis, chorioretinitis, or myocarditis. This intracellular parasite does not ordinarily cause diarrhea and is not found in stools.

371. The answer is c. *(Hay et al, p 418. Kliegman et al, p 2687. McMillan et al, pp 848-849. Rudolph et al, pp 1195-1197.)* The combination of erythema multiforme and vesicular, ulcerated lesions of the mucous membranes of the eyes, mouth, anus, and urethra defines the Stevens-Johnson syndrome

(erythema multiforme major). Fever is common, and even pulmonary involvement occasionally is noted; the mortality rate can approach 10%. Common complications include corneal ulceration; dehydration due to severe stomatitis, and, subsequently, poor fluid intake; and urinary retention caused by dysuria. Among the known causes of the Stevens-Johnson syndrome are allergy to various drugs (including phenytoin, barbiturates, sulfonamides, and penicillin) and infection with a variety of organisms including *Mycoplasma pneumoniae* or herpes type 1. Erythema multiforme is sometimes confused with urticaria early in the course because both can have a target-like lesion. The former has a target center that contains a papule or vesicle, which progresses to blister and necrosis. In contrast, urticaria can have a bluish center, but the lesions are transient (often lasting less than 24 hours) and are pruritic. Kawasaki disease is an acute febrile illness of unknown etiology, sharing many of its clinical manifestations with scarlet fever. Scarlatiniform rash, desquamation, erythema of the mucous membranes that produces an injected pharynx and strawberry tongue (but not sloughing, as in the case presentation), and cervical lymphadenopathy are prominent findings in both. Persons with rubeola develop a severe cough, coryza, photophobia, conjunctivitis, and a high fever that reaches its peak at the height of the generalized macular rash, which typically lasts for 5 days. The oral changes include Koplik spots (transient white pinpoint lesions on a bright red buccal mucosa often in the area opposite the lower molars) but not sloughing.

DRESS (drug rash, eosinophilia, and systemic symptoms) is another consideration in this patient. The condition is usually associated with anticonvulsants, but has been associated with other medications such as antibiotics. The skin findings are the same as erythema multiforme (EM), but patients may also have lymphadenopathy; eosinophilia; leukocytosis; fever; and liver, kidney, and lung involvement.

372. The answer is e. *(Hay et al, pp 1234-1235. Kliegman et al, p 1508. McMillan et al, pp 1368-1369. Rudolph at al, pp 1111-1112.)* One to seven days following the ingestion of pork or other improperly cooked meat infected with *T spiralis,* symptoms develop, including abdominal pain, nausea, vomiting, and malaise. During the second week, muscle invasion occurs, which causes edema of eyelids, myalgia, weakness, fever, and eosinophilia. The muscle organisms can become encysted and remain viable for years.

Enterobius vermicularis (pinworm) causes a localized infestation resulting in perianal pruritus and does not have a tissue phase that would cause eosinophilia. Sporotrichosis is a chronic fungal infection that typically is

limited to cutaneous and subcutaneous tissues. *Giardia* and *Cryptosporidium* rarely penetrate the gut wall, instead causing gas, diarrhea, and bloating as common findings, but not fever and eosinophilia.

373. The answer is e. *(Hay et al, pp 1167-1169. Kliegman et al, pp 1164-1168. McMillan et al, pp 1082-1087. Rudolph et al, pp 970-972.)* The patient in the question likely has meningococcemia, but RMFS is also a consideration. RMFS and meningococcemia can present in a similar fashion, although a rapid course as outlined in the question is more common of meningococcemia. Meningococcemia can be complicated by a variety of disorders, including meningitis, purulent pericarditis, endocarditis, pneumonia, otitis media, and arthritis. (Arthritis associated with meningococcemia may be mediated by an immune mechanism rather than by bacterial invasion of the joint.) The potent endotoxin of the causative organism, *N meningitidis,* can induce shock, disseminated intravascular coagulation with associated hemorrhaging, and acute adrenal failure caused by localized intra-adrenal bleeding; these reactions can be collectively referred to as the Waterhouse-Friderichsen syndrome. Vaccines against *N meningitidis* groups A, C, Y, and W135 are now available, and the CDC's Advisory Committee on Immunization Practices now recommends meningococcal immunization of all adolescents (11-18 years old). Prophylaxis with sulfadiazine for sensitive organisms or with rifampin for those in close contact with affected persons is recommended.

In contrast, RMFS is often a more indolent infection, with rash developing days after the onset of the fever and other symptoms. This course is not invariable, however, and antibiotic therapy for the patient for whom RMFS and meningococcemia cannot be differentiated should not be delayed.

Measles presents in a child with a several days' history of malaise, fever, cough, coryza, and conjunctivitis followed by the typical, widespread, erythematous, maculopapular rash. Koplik spots, white pinpoint lesions on a bright red buccal mucosa often in the area opposite his lower molars, appear transiently and are pathognomonic. Henoch-Schönlein purpura can have a distribution of rash that appears purpuric (actually a vasculitis) over the lower extremities, but its rapid progression and shocklike state as presented in the question would be distinctly unusual.

374. The answer is a. *(Hay et al, pp 708-709. Kliegman et al, pp 2440-2441. McMillan et al, pp 2679-2680. Rudolph et al, p 2169.)* The importance and urgency of the lumbar puncture in cases of suspected meningitis outweigh the usual niceties in the performance of procedures. Infants and children require adequate restraints, preferably local anesthesia, and sometimes sedation.

Contraindications are few and include increased intracranial pressure in the patient without an open fontanelle that can result in herniation; severe cardiorespiratory distress; skin infection at the puncture site; and severe thrombocytopenia or other coagulation disorder, suggested by the oozing IV and venipuncture sites.

375. The answer is c. *(Hay et al, pp 500-502. Kliegman et al, pp 1763-1766. McMillan et al, pp 694-695. Rudolph et al, pp 1275-1277.)* The description is that of croup. This infection involves the larynx and trachea; it usually is caused by parainfluenza or respiratory syncytial viruses. The usual age range for presentation is 6 months to 6 years. Symptoms include low-grade fever, barking cough, and hoarse, inspiratory stridor without wheezing. The pharynx can be normal or slightly red, and the lungs are usually clear. In children in severe respiratory distress, prolonged dyspnea can progress to physical exhaustion and fatal respiratory failure. Expiratory stridor is usually associated with a fixed obstruction, such as a tumor or vascular ring. Because agitation can be a sign of hypoxia, sedation should not be ordered. Hyperinflation on chest x-ray is seen in asthma, not croup. One condition in the differential in this child is epiglottitis, a now rare disease owing to widespread use of the *H influenza* b vaccine. Its presentation is more abrupt, with higher fever in rather toxic-appearing patients.

376 to 379. The answers are 376-b, 377-a, 378-e, 379-c. *(Hay et al, pp 922, 925-928. Kliegman et al, pp 879-880, 884-891. McMillan et al, pp 2445-2446, 2462-2464, 2467-2468. Rudolph et al, pp 793-800.)* Many primary immunologic deficiencies can be classified as defects of T-lymphocyte function (containment of fungi, protozoa, acid-fast bacteria, and certain viruses) and B-lymphocyte function (synthesis and secretion of immunoglobulins). Among the T-cell diseases is DiGeorge anomaly, in which defective embryologic development of the third and fourth pharyngeal pouches results in hypoplasia of both thymus and parathyroid glands. Associated findings with DiGeorge anomaly include CATCH: *C* for cardiac, *A* for abnormal faces, *T* for thymic hypoplasia, *C* for cleft palate, and *H* for hypocalcemia.

Primary B-cell diseases include X-linked agammaglobulinemia (XLA, or Bruton disease), a deficiency of all three major classes of immunoglobulins, as well as other selective deficiencies of the immunoglobulins or their subgroups. This condition usually presents after 3 months of age (after maternal antibodies wane) with recurrent and often simultaneous bouts of otitis media,

pneumonia, diarrhea, and sinusitis, but usually without fungal and viral infections. Combined T- and B-cell diseases include the X-linked recessive Wiskott-Aldrich syndrome of mild T-cell dysfunction, diminished serum IgM, marked elevation of IgA and IgE, eczema, recurrent middle-ear infections, lymphopenia, and thrombocytopenia. Patients with the catastrophic combined T- and B-cell disease, known as severe combined immunodeficiency disease (Swiss-type lymphopenic agammaglobulinemia or SCID), have deficient T and B cells. Consequently, they have both, lymphopenia and agammaglobulinemia, as well as thymic hypoplasia. Chronic diarrhea; rashes; recurrent, serious bacterial, fungal, or viral infections; wasting; and early death are characteristic. Other T- and B-cell deficiencies include ataxia telangiectasia and chronic mucocutaneous candidiasis.

Job-Buckley syndrome is a disorder of phagocytic chemotaxis associated with hypergammaglobulin E, eczema-like rash, and recurrent severe staphylococcal infections.

380 to 385. The answers are 380-i, 381-b, 382-a, 383-d, 384-e, 385-f. *(Hay et al, pp 608-609, 1119-1120, 1123-1124, 1132-1133, 1156-1158, 1178-1182, 1196-1197, 1204-1205. Kliegman et al, pp 1145-1149, 1157-1159, 1193-1196, 1208-1210, 1219-1222, 1337-1341, 1372-1376, 1572-1573. McMillan et al, pp 438, 482-483, 1053-1058, 1079-1081, 1106-1110, 1241-1246, 1260-1261, 1272-1275. Rudolph et al, pp 923-928, 945-946, 987-990, 999-1001, 1035-1040, 1110-1111, 1430-1431.)* EBV can produce a number of clinically important syndromes, one of which is mononucleosis as described in the college-age patient with fever and sore throat. Other symptoms might include headache, profound fatigue, abdominal pain, and myalgia. Splenic enlargement is common, and contact sports are to be avoided. The rash ("ampicillin rash") is poorly understood but occurs so commonly as to be diagnostic when seen; it is self-resolving.

Pseudomonas is a ubiquitous organism. Most infections with the organism are opportunistic, involving several organs. Skin infections related to burns, trauma (such as in a puncture wound through a tennis shoe), and use of swimming pools are not uncommon. Injuries through a tennis shoe are prone to pseudomonal infections because of the warm, moist nature of the shoe's environment. In contrast, a wound through a bare foot would be associated with cutaneous flora such as *Staphylococcus*.

Bartonella henselae is the major etiologic agent for cat-scratch disease (the 5-year-old with a feline scratch). History of a scratch or a bite from a kitten is often positive, and fleas are often a factor in transmission. Diagnosis

is usually by history and presenting signs and symptoms, as described in the question. Another form of the disease, Parinaud oculoglandular syndrome, occurs when the primary site of inoculation occurs in or near the conjunctivae, resulting in a moderately severe conjunctivitis and preauricular lymph adenopathy.

Roseola (exanthema subitum) is a common acute illness of young children (such as the 9-month-old child with fever and transient rash), characterized by several days of high fever followed by a rapid defervescence and the appearance of an evanescent, erythematous, maculopapular rash. Human herpesvirus 6 (HHV-6) has been identified as its main cause.

Urinary tract infections are the most common cause of bacterial infections in the young child. The incidence is slightly higher in the uncircumcised as compared to the circumcised male. *E coli* is a leading cause.

Infection with *H pylori* is associated with antral gastritis and primary duodenal ulcer disease, with the symptoms described in the question of the 9-year-old with abdominal pain and blood in the stool. Culture for *H pylori* requires endoscopy and gastric biopsy. The biopsied tissue can be tested for urease activity and examined histologically after special staining. Alternatively, noninvasive tests involving detection of metabolic products of *H pylori* (urease activity) or antibodies against *H pylori* can be demonstrated.

386 to 388. The answers are 386-d, 387-c, 388-a. *(Hay et al, pp 1171, 1179, 1206. Kliegman et al, pp 1171, 1196, 1266. McMillan et al, pp 1066, 1088-1090, 1139-1140. Rudolph et al, pp 969, 987, 1003.)* Certain pathogens do not grow on routine culture media. A routine stool culture will not make the diagnosis of enterohemorrhagic *E coli*, since some *E coli* strains are normal intestinal flora. To differentiate the pathogenic organism in the case of the patient with hemolytic uremic syndrome, stool culture on sorbitol MacConkey will help diagnose *E coli* O157:H7. While there are rapid gonorrhea assays available now, the gold standard is still culture. Regular chocolate agar can be used for specimens from usually sterile areas (blood, spinal fluid); a selective culture medium (such as modified Thayer-Martin media, which includes several antimicrobial compounds) is needed for cultures of sites normally colonized with other organisms (cervix, rectum). Syphilis is not usually cultured. It is identified by direct visualization of treponemes with dark field microscopy, or with the use of serological tests such as the nontreponemal rapid plasma reagin (RPR) test, or the treponemal-specific fluorescent treponemal antibody absorption (FTA-ABS) test.

389 to 392. The answers are 389-c, 390-a, 391-g, 392-b. *(Hay et al, pp 51, 518-525, 1160-1167, 1239-1252. Kliegman et al, pp 1125, 1245-1247, 1278-1280, 1286-1287, 1795-1799. McMillan et al, pp 537-540, 1102-1106, 1146-1147, 1395-1400, 1404-1410. Rudolph et al, pp 929-931, 949-959, 965-967, 1980-1986.)* Approximately 10% to 20% of infants born to mothers with *Chlamydia trachomatis* infection develop pneumonia. The presentation of this pneumonia usually occurs between 1 and 3 months of age, with cough, tachypnea, and lack of fever. Examination reveals rales but not wheezing. Laboratory data suggestive of *C trachomatis* infection include an increase in eosinophils in the peripheral blood. The chest radiograph shows hyperinflation with interstitial infiltrates.

Mycoplasma pneumoniae is a common cause of pneumonia in the school-age child or young adult. Usual presentation includes the gradual onset of headache, malaise, fever, and lower respiratory symptoms. Typically, the cough (often nonproductive) worsens for the first 2 weeks of the illness, and then slowly resolves over the ensuing 3 to 4 weeks. Early in the disease, the physical examination is remarkable for a paucity of signs; the patient usually has a few fine rales. Later, the dyspnea and fever become worse. Radiographic findings include an interstitial or bronchial pattern, especially in the lower lobes, and commonly on only one side. The diagnosis is usually made on clinical grounds.

Staphylococcal pneumonia is caused by *S aureus*. It is a rapidly progressive and life-threatening form of pneumonia most commonly seen in children less than 1 year of age. Commonly, the child has an upper respiratory infection for several days, with the abrupt onset of fever and respiratory distress. Pleural effusion, empyema, and pyopneumothorax are common complications. Laboratory evidence of this disease can include a markedly elevated WBC count with left shift. Radiographic findings include nonspecific bronchopneumonia early in the disease, which later becomes more dense and homogeneous and involves an entire lobe or hemithorax.

Pneumococcal pneumonia often presents with sudden onset of fever, cough, and chest pain. This child may have failed outpatient therapy because of increased incidence of resistant organisms. Pleural effusions or empyema are commonly seen; chest tube evacuation of the fluid is often required. Depending on sensitivity patterns in a particular community, therapy with high-dose penicillin, cefuroxime, amoxicillin/clavulanate, or even vancomycin may be required.

A high index of suspicion is needed to diagnose tuberculosis. An exposure history is helpful but not always present. Many children who are infected

have a positive purified protein derivative (PPD) as the only evidence. Children at higher risk of active disease include those who are very young, malnourished, immunodeficient or immunosuppressed, or diabetic. Most active disease is pulmonary, but can also be disseminated and involve the CNS, bone, skin, and abdomen. Pulmonary disease includes a parenchymal focus and regional lymphadenopathy. The pleura is frequently involved.

Fungal infections can resemble TB, and can be difficult to diagnose. In the United States, *Histoplasma* is found in the Ohio and Mississippi river valleys. Human-to-human transmission does not occur, so exposure to an endemic area is required. About half of histoplasmosis infection is asymptomatic and diagnosed based on scattered calcifications in the lungs. In immunocompetent individuals, the disease usually resolves in 2 weeks. Other clinically significant fungi that cause lung disease include *Coccidioides, Cryptococcus, Blastomyces,* and *Aspergillus*. *Pneumocystis jiroveci* (formerly *Pneumocystis carinii*) is technically a fungus, but responds to antiparasitic medications.